CLAIMS

What is claimed is:

1. A method for performing a semiconductor process wafer drying process comprising the steps of:

providing a semiconductor wafer having a process surface disposed in an enclosed drying space following exposure of the process surface to water;

supplying a solvent vapor to the drying space at a predetermined concentration from a solvent vapor source and at least one solvent vapor supply line;

determining at least one of a solvent vapor concentration and a solvent vapor temperature in the drying space during the drying process; and,

selectively heating in response to the determined solvent concentration at least one of at least a portion of one of the solvent vapor source, the at least one solvent vapor supply line, and at the drying space to alter the solvent vapor concentration in the drying space.

2. The method of claim 1, wherein the solvent vapor concentration is maintained within a range of about 8,000 to about 20,000 ppm.

3. The method of claim 1, wherein the at least a portion of at least one of the solvent vapor source, the at least one solvent vapor supply line, and at the drying space are maintained within a temperature range of about 15 °C to about 35 °C during the drying process.

4. The method of claim 1, wherein the solvent vapor comprises an alcohol.

5. The method of claim 4, wherein the alcohol comprises isopropyl alcohol.

6. The method of claim 1, wherein the solvent vapor source comprises an inert gas flow through the solvent to form the vapor solvent.

7. The method of claim 1, further including selectively increasing a solvent vapor flow along the at least one solvent vapor supply line in response to a determined solvent vapor concentration.

8. The method of claim 1, wherein the drying space is heated by a heat exchange surface positioned proximal to at least a portion of the semiconductor wafer edge.

9. The method of claim 1, wherein the solvent vapor is directed in a stream parallel to the process surface.

10. The method of claim 1, wherein the solvent vapor is directed at the process surface/fluid interface.

11. The method of claim 1, wherein the solvent vapor is supplied simultaneously with the process wafer being withdrawn from a water containing rinsing fluid into the drying space.

12. The method of claim 11, wherein the wafer is withdrawn from the in the drying space at a rate of about 1 to about 8 inches per minute.

13. The method of claim 1, wherein temperature sensors are provided in communication with a controller to determine a temperature of the at least one of the solvent vapor source, the at least one solvent vapor supply line, and the drying space.

14. The method of claim 1, wherein gas flow rate controllers are provided in responsive communication with a controller to control a flow rate of the solvent vapor in the at least one solvent vapor supply line.

15. The method of claim 1, wherein heating elements are provided in heat exchange relationship with the at least one solvent vapor source and the at least one solvent vapor supply line said heating elements in responsive communication with a heating source which is in responsive communication with a controller to selectively control a sensed temperature to reduce condensation of the solvent vapor.

16. A wafer drying apparatus for carrying out a process wafer vapor drying process in a micro-integrated circuit manufacturing process comprising:

an enclosed vapor drying space for positioning at least one process wafer and contacting the at least one process wafer with a stream of solvent vapor the enclosed vapor drying space including heat exchange surfaces positioned to be parallel to a wafer drying position during a vapor drying process;

the vapor drying space further including at least one of a solvent vapor concentration sensor and a temperature sensor for respectively sensing one of a solvent vapor concentration and a solvent vapor temperature;

a solvent vapor source including a vapor source heating element in heat exchange relationship with the solvent vapor source and a vapor source temperature sensor disposed for sensing at least one of a vapor source heating element temperature and a solvent vapor source temperature; and,

at least one solvent vapor supply line comprising a gas flow rate controller disposed for carrying the solvent vapor from the solvent vapor source to the vapor drying space;

wherein the at least one gas supply line includes at least one supply line heating element for heating at least a portion of the at least one gas supply line and at least one gas supply line temperature sensor for sensing a gas supply line temperature.

17. The wafer drying apparatus of claim 16, wherein the at least one of a solvent vapor concentration sensor and a temperature sensor are in communication with a controller for responsively controlling a heat exchange surface temperature to control the vapor drying space temperature.

18. The wafer drying apparatus of claim 16, wherein the vapor source temperature sensor is in communication with a controller for responsively controlling a vapor source heating element to control the solvent vapor source temperature.

19. The wafer drying apparatus of claim 16, wherein the vapor source temperature sensor is in communication with a controller for responsively controlling a vapor source heating element to control the solvent vapor source temperature.

20. The wafer drying apparatus of claim 16, wherein the at least one gas supply line temperature sensor is in communication with a controller for responsively controlling the at least one supply line heating element to control the at least one gas supply line temperature.

21. The wafer drying apparatus of claim 16, wherein the solvent vapor stream inlet is positioned in an upper portion of the vapor drying space to direct a solvent vapor flow downward and parallel to a process wafer surface in a wafer drying process.